

ifornia. They may form cones when only two or three feet tall and as yet unbranched. Fairly large individuals occur also on the ridge. Reproduction is good in the burned areas.

Mention of *Cupressus macrocarpa* as occurring at San Quintin is frequently found in the literature. This statement must be a blunder. San Quintin is itself situated on low sandy soil on an estuary. Any trees nearby would be very conspicuous. There is no evidence that the cypress may be found in the interior hills to the east, for they are very arid, nor does the species occur in the low range of hills which lies immediately along the coast north of San Quintin. These are apparently of volcanic origin and are covered with Coastal Sage. The first named author has traversed this area both by automobile and by foot without finding any evidence of their occurrence there. It may be that specimens of *C. Forbesii* from the canyons described above, were ascribed to San Quintin, or it may be that cultivated trees of *C. macrocarpa*, which are planted at the small presidio near San Quintin, were thought to be native.

Department of Botany,
University of California, Los Angeles,
April, 1940.

A REVISION OF THE GENUS MONOLOPIA

ETHEL CRUM

Monolopia is an endemic Californian genus of the Compositae belonging to section *Eriophyllanae* of the tribe *Helenieae*. It is confined mainly to the North and South Coast ranges, the bordering portions of the San Joaquin and Sacramento valleys and to cismontane southern California. All species occur in the inner South Coast Ranges which thus represent the center of distribution; probably, also the center of origin is located in the same general area. The distribution pattern presented by the genus is that of two morphologically rather primitive species, both with restricted ranges and habitats, and two morphologically more advanced species, more tolerant and widely ranging and apparently now actively extending their territory (text fig. 1).

All species of *Monolopia* are vernal annuals, inhabiting for the most part slopes and valleys in the Upper and Lower Sonoran zones; one species, *M. gracilens*, enters the Transition. When growing among other annual composites, the white lanate herbage, and the usually numerous bright yellow pedunculate heads, often one or two inches in diameter, are readily recognizable. Where species of the genus occur they are often dominant and whether in small colonies or covering extensive areas, constitute one of the most attractive components of the spring floral display in California.

As here delimited, *Monolopia* may be considered a resultant of three evolutionary tendencies toward reduction common in the *Helenieae*: reduction in number of involueral bracts and close correlation of these with the number of ray flowers, loss of receptacular bracts, loss of pappus; there is also at least one additional important evolutionary trend—the development of a sub-bilabiate ray corolla, manifested by a small posterior lobe. Excluding *Pseudobahia*, by some botanists considered a section of *Monolopia*, the genus constitutes a natural group of four species. The following combination of characters, in addition to those mentioned above, serve to distinguish the group: inflorescence paniculate, terminating the branches, the heads often rather long-pedunculate; the presence of black-pigmented hairs on the phyllaries, more conspicuously developed distally; presence of moniliform hairs on the lobes of the disk corollas.

The genera of the section *Eriophyllanae* most closely related to *Monolopia* are probably *Eriophyllum* and *Pseudobahia*. The *Eriophyllum lanatum* aggregate is probably ancestral to both *Monolopia* and *Pseudobahia*, also to certain annual species of *Eriophyllum*, such as *E. ambiguum* and *E. nubigenum* (Constance, L. the genus *Eriophyllum*. Univ. Calif. Publ. Bot. 18: 69–123. 1937). *Monolopia* agrees closely with these groups in the character of the indument and in the general aspect; it differs from both *Eriophyllum* and *Pseudobahia* in the sub-bilabiate ray corollas, and in the constant absence of pappus, and from *Pseudobahia* in addition by the reduced number of phyllaries and the details of floral structure.

Important tendencies toward divergence within the genus are: flattening of the achenes; union of the phyllaries. Flattening of the achenes has usually been considered an important character in the *Helenieae* and has been used to differentiate genera or other related groups. However, this tendency is by no means uniformly developed in *Monolopia*. Two of the species, *M. major* and *M. lanceolata*, have disk achenes which are markedly obcompressed, in this respect farthest removed from all members of the genus *Eriophyllum* (text fig. 2). Both species are marked by large size and vigor and agree in the divergent peduncles and large conspicuous heads with long, deeply dentate ray corollas. *Monolopia major*, shows evolutionary advance in such morphological characters as the united phyllaries, and the more obcompressed disk achenes which have developed a narrow membranous margin, usually more conspicuous near the base. Both *Monolopia lanceolata* and *M. major* have relatively extensive ranges; together they occupy territory from Tehama County to Riverside County, *M. major* being the only representative of the genus north of Contra Costa County and *M. lanceolata* the only representative south of Kern County. As indicated on the map (text fig. 1) by outlying stations, both are apparently actively extending their ranges. The two more primitive species have disk achenes of

almost equal width and thickness. They are further characterized by lower, more slender habit, distinct phyllaries, smaller heads, and shorter, subtire ray corollas. Their ranges and habitats are more restricted than those of *M. major* and *M. lanceolata*. *Monolopia gracilens*, the most primitive member of the genus, is confined to the South Coast Ranges, occupying for the most part, half-shaded slopes in the Upper Sonoran and Transition zones. The remaining species, here described as new, inhabits the low barren foothills of the Temblor and San Carlos ranges and of the Tehachapi Mountains at the head of San Joaquin Valley. The two species thus have different ranges and habitats and are separated morphologically by constant differences in habit such as the angle of divergence of the upper branches and peduncles, and by the length of the disk corollas, and the length and pubescence of the achenes.

The taxonomic history of *Monolopia* is relatively brief. The genus was erected by De Candolle in 1834 on specimens collected in California by Douglas. The name, derived from two Greek words meaning "single covering," refers to the uniseriate involucre. The generic description is based almost exclusively on *M. major*, the type species. In his comment on the second species named, *M. minor*, De Candolle states: "car. generis in floribus junioribus non rite vidi." The identity of *M. minor* remains doubtful. If properly represented by the Douglas specimens, so named in Gray Herbarium, it cannot be referred to *Monolopia*. Receptacular hairs are present, a character not observed in any *Monolopia* collection examined; no posterior lobe is present on the ray corollas. The combination of characters presented by the specimens of *M. minor* is not known in any species of *Eriophyllum* to which *M. minor* has been referred by Rydberg (N. Am. Fl. 34: 86. 1915). Heller believed he had rediscovered the species in *Pseudobahia Heermannii* but the phyllaries of the latter species are more numerous, of different shape, and show a median thickening easily observable even in immature specimens. Moreover, in the Gray Herbarium specimens of *M. minor*, the hairs at the base of the corolla throat, characteristic of *Pseudobahia*, cannot be observed. In generic characters, however, these specimens do not differ from *Baeria*, and, since they were probably collected in the coastal region of California, may represent immature, unusually lanate plants of *Baeria hirsutula* Greene. *Monolopia lanceolata* Nuttall was described in 1848 from plants collected at "Pueblo de los Angeles, Upper California" by William Gambel. This entity was considered by Gray (Bot. Calif. 1: 384. 1876) and by Hall (Univ. Calif. Publ. Bot. 3: 176. 1907) as a variety of *M. major*. It was referred erroneously by Bentham (Gen. Pl. 21: 400. 1873) to *Bahia arachnoidea* Fisch. & Ave.-Lall. *Monolopia gracilens* Gray was described in 1883 from specimens collected by Torrey "near New Almaden and Santa Cruz." Hall (*op. cit.*)

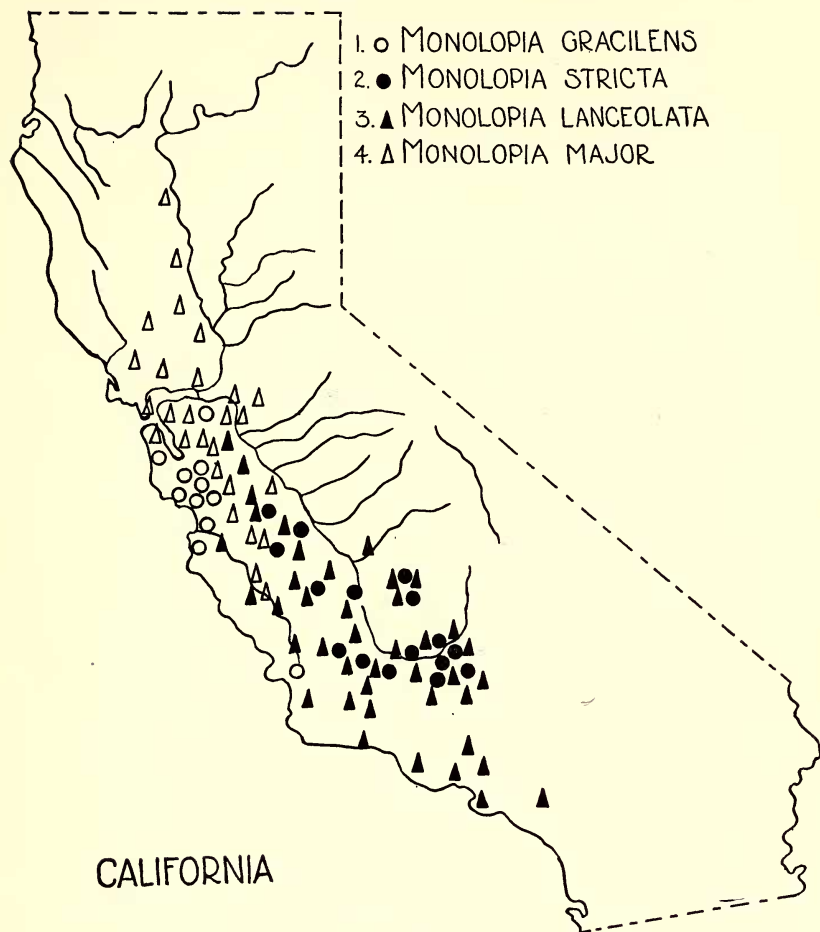


FIG. 1. Distribution of *Monolopia*.

stated in 1907 that *M. gracilens* "should be considered only a small-flowered variety of *M. major*," and in 1915 (N. Am. Fl. 34: 176) commented as follows: "Characters as given for *M. major* (of which this is perhaps a geographic race)." Concurring in these views, MacBride, in 1918, (Contrib. Gray Herb. n. ser. 3: 49.) reduced *M. gracilens* to a variety of *M. major*. There has been no recent comprehensive treatment of the genus.

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vard University (G); W. L. Jepson Herbarium, Berkeley (J); Missouri Botanical Garden (MB); New York Botanical Garden (NY); Academy of Natural Sciences, Philadelphia (PA); Pomona College, Claremont, California (P); United States National Herbarium (US); Vegetation Type Map Herbarium, California Forest and Range Experiment Station, Berkeley (VTM).

TAXONOMY

MONOLOPIA DC., Prodr. 6: 74. 1837; Bentham and Hooker, Gen. Pl. 2¹: 400. 1873; Engler and Prantl, Pflanzenfam. 4³: 101, fig. 62, 258. 1891; Hall ex Rydberg, N. Am. Fl. 34: 82. 1915.

Vernal annuals with taproot. Stems erect, simple to many-branched at or above the base. Herbage lanate, the indument white except on distal portions of the involucre where black pigment is usually developed, often deciduous except at base of involucre and upper portion of peduncle. Lower leaves (1-4 pairs) opposite, oblanceolate, attenuate into a margined petiole; cauline leaves sessile, slightly amplexicaul, narrowly to broadly lanceolate or oblong lanceolate, apex obtuse, acute or acuminate; uppermost leaves similar, reduced, becoming bract-like. Heads heterogamous, few to numerous, medium to large, pedunculate, terminating the branches; peduncles rather long, strictly ascending to divergent-ascending. Involucre hemispheric or campanulate, foliaceous (or submembranous at base); phyllaries 6-13 (usually 8), 1-seriate (in *M. gracilens*, one to three small, lanceolate, hyaline, inner bracts sometimes present), distinct to the base, appressed, lanceolate-oblong to rhombic-ovate, acute or acuminate, the margins slightly imbricate; or phyllaries connate into a cup with ovate to deltoid lobes. Receptacle conic, glabrous, naked, nearly smooth, palisade-like or more or less scrobiculate. Rays 1-seriate, 6-13 (usually 8), corresponding in number to the phyllaries, pistillate, fertile, yellow, sub-bilabiate; limb of ray corolla spreading, usually ample, oval, oblong, cuneate-oblong or cuneate-obovate, the apex truncate and emarginate or 2- or 3-dentate, or rounded and entire or minutely denticulate or notched; posterior lobe minute, ovoid to suborbicular, denticulate or entire (rarely incised); tube short, slender, glandular-hispidulous. Disk florets few to numerous, hermaphroditic, fertile, tube slender, glandular-hispidulous, shorter than the throat; throat campanulate or tubular-campanulate; lobes 5, erect or slightly spreading, externally and internally bearing short moniliform hairs. Stamens 5, anthers ecaudate, apical appendages ovate. Style branches of rays slender, obtuse, of disk-florets stoutish, very obtuse or subtruncate. Achenes strigulose to glabrate, gray, black or brownish, uniform in color or, when immature, somewhat mottled, dimorphic, obpyramidal, the apex with a small areola (in *M. major* lateral margins of ray and disk achenes

and, rarely, ventral angle of ray achene narrowly membranous); ray achenes triquetrous, somewhat obcompressed, or width and thickness subequal, dorsally convex (sometimes subcarinate); disk achenes more or less obcompressed, carinate dorsally and ventrally, or quadrate, width and thickness subequal; achenes of central disk flowers sometimes not maturing.

Type species: *Monolopia major* DC.

KEY TO THE SPECIES

- Phyllaries distinct to the base, the margins slightly imbricate; throat of disk corollas short-campanulate, abruptly contracted into the tube; disk achenes quadrate, not margined.
- Disk achenes subequal in width and thickness; limb of ray corollas rounded, entire, slightly notched or denticulate at apex, 4-9 (or 16 mm.) long.
- Peduncles strongly divergent at base; achenes glabrate, blackish or dark brown, 2.0 mm. long; basal and lower cauline leaves approximate, usually conspicuously dentate; Upper Sonoran and Transition zones, Santa Cruz and Santa Lucia mountains, San Mateo and Contra Costa counties to San Luis Obispo County 1. *M. gracilens*
- Peduncles strict; achenes densely gray-strigulose, 2.2-3.0 mm. long; leaves entire or nearly so, the lower not crowded; Lower Sonoran Zone, foothills and plains bordering the San Joaquin Valley, San Benito County to Kern County 2. *M. stricta*
- Disk achenes obcompressed, usually uniformly and densely gray-strigulose, 2.0-3.8 mm. long; limb of ray corollas truncate, dentate at apex, 9.0-21 mm. long; peduncles divergent; Upper and Lower Sonoran zones; inner South Coast Ranges, plains and foothills bordering San Joaquin Valley, Tehachapi region; cismontane southern California 3. *M. lanceolata*
- Phyllaries united one-half their length, the margins of the lobes not at all imbricate; throat of disk corollas tubular-campanulate, attenuate into the tube; limb of ray corollas truncate, dentate at apex, 8-21 mm. long; disk achenes obcompressed, glabrate or strigulose toward apex, narrowly membranous margined especially toward base, 2.5-4.0 mm. long; Upper Sonoran Zone, Coast Ranges and western borders of Sacramento-San Joaquin Valley, Tehama County to Monterey County 4. *M. major*

1. *MONOLOPIA GRACILENS* Gray, Proc. Am. Acad. 19: 20. 1883.

M. major var. *gracilens* Macbr. Contr. Gray Herb. 3: 49. 1918.

Stems 10-40 cm. (45-90 cm.) high, slender to stoutish, main stem erect, simple, branched near the middle, the branches divergent, or often many-branched at base, the branches decumbent-ascending; herbage white-lanate or -arachnoid, the indument often partially deciduous in age (persisting at least at apex of peduncle); basal and lower cauline leaves, 3-7 cm. long, 2-1 cm. broad, subsulate or crowded below, narrowly to broadly oblanceolate, margins saliently dentate to subentire; median and upper cauline leaves broadly lanceolate or subligulate, margins saliently

dentate to subentire, apex acute or acuminate, 2–10 cm. long, .3–2.5 cm. broad; uppermost leaves similar or narrowly lanceolate, often entire; inflorescence subcorymbose; peduncles divergent-ascending, 2.5–12 cm. long; heads 1–70, disk 7–10 mm. in diameter; phyllaries 7–11 (6–13), distinct to base, 1-seriate, the margins slightly imbricate, or sometimes with one to three small hyaline inner bracts, distally foliaceous, usually persistently black-lanate and somewhat glandular-granuliferous, proximally submembranous, striately 6- to 9-nerved, the indument with less black pigment and usually deciduous, narrowly to broadly ovate or rhombic, attenuate into the acute or acuminate apex, 5–6 mm. long, 1.7–2.5 mm. broad; receptacle sharply conical, 2–3.2 mm. long, 1.1–2 mm. in diameter, the attachment scars conspicuous; rays 7–11 (6–13), 4–9 mm. (or 16 mm.) long, deep yellow with 7–11 greenish veins, the limb broadly to narrowly oval or oblong, apex subentire, shallowly emarginate, or very minutely notched or crenulate, posterior lobe deltoid-ovate to suborbicular, entire or minutely denticulate, .1–.8 mm. long, tube hispidulous, .8–1.2 mm. long; disk-florets 10–90, deep yellow, 1.5–2.6 mm. long, throat campanulate, 1–1.5 mm. long, tube glandular-hispidulous, .4–.8 mm. long, lobes .2–.4 mm. long, moniliform hairs sparse; achenes black or blackish brown, when immature with grayish or brownish mottling, minutely and sparsely strigulose to glabrate; ray achenes slightly convex and often inconspicuously carinate dorsally, 1.7–2 mm. long, 1.8 mm. broad, .7 mm. thick; disk achenes 2 mm. long, .6–.8 mm. broad, .6–.8 mm. thick.

Partly shaded slopes at altitudes of 500 to 3800 feet, Upper Sonoran and Transition zones; often occurring on disturbed areas such as roadside cuts and chaparral burns; also on serpentine outcrops; South Coast ranges (mainly Santa Cruz and Santa Lucia mountains), San Mateo and Contra Costa counties to San Luis Obispo County. Flowering period: April, May, June.

Specimens examined. Contra Costa County: Mount Diablo, *Eastwood 4518* (CA, US), *L. S. Rose 35166* (CA, MB, P, UC); Mount Diablo, Eagle Ridge, *M. L. Bowerman 1339* (UC), below summit, *767* (UC), Muir area, southeast slope, *2057* (UC), below Pioneer Camp, *1946* (UC). San Mateo County: Pilarcitos Lake and Canyon, *Davy 1124* (UC); Lake Pilarcitos, June, 1893, *Michener & Bioletti* (MB); Woodside, May 9, 1920, *Eric Walther* (CA); Berenda Farm near Redwood City, May 9, 1930, *Otto Holm* (CA). Santa Clara County: New Almaden, 1865, *Torrey 237* (G, type; NY, isotype?); Almaden Ridge, *J. T. Howell 1898* (CA); Alamitos Creek, 1.5 miles south of New Almaden, *Constance 2078* (NY, UC); Alamitos Creek near Hacienda School, May 12, 1923, *L. Lorraine* (D); Santa Clara, *S. G. Isaman* (G); Black Mountain road, May 5, 1894, *Dudley* (D); Black Mountain, 3 miles below Mountain House, Adobe Creek road, *Pendleton 1484* (CA, UC, US); Loma Prieta, eastern slope, *Davy 596*

(UC), 663 (UC); Loma Prieta, *Elmer 5012* (CA, D, MB, NY, UC, US); Gilroy, *Elmer 4729* (CA, D, MB, NY, P, UC, US); Stevens Creek, *Pendleton 776* (UC); San Martin, *Chandler 915* (UC); Saratoga, *Davy 246* (UC); Coyote Creek, 3 miles east of Madrone, *J. T. Howell 12991* (CA, UC); mouth of Coyote Creek Canyon, *Hoover 3269* (UC); Monte Bello Ridge, *H. S. Yates 5520* (VTM); Hecker Pass, Watsonville-Gilroy road, *H. M. Hall 13064* (P); Hecker Pass, 1.4 miles northeast of summit, *Crum 2089* (CA, D, G, MB, NY, P, PA, UC, US); summit of first ridge west of Los Gatos, *Heller 7428* (D, G, MB, NY, PA, UC, US); Santa Cruz Mountains near Los Gatos, June 4, 1907, *R. J. Smith* (UC). Santa Cruz County: Santa Cruz Mountains, *Rattan 36* (D), June, 1889, *Brandege* (UC); Santa Cruz, *M. E. Jones 2333* (D, P), July 12, 1883, Pringle (G), *Bolander 48* (G); Charmichael's Mill, *Pendleton 938* (UC, US); Camp Idle, Santa Cruz Mountains, *H. Davis 41* (UC); Hecker Pass, west of summit, *Keck 4568* (CA, UC, US); west of Mount Umunhum, *C. M. Belshaw 2239* (VTM); Glenwood, Santa Cruz Mountains, April, 1900, *H. Davis* (G, US); Upper San Lorenzo Canyon, 9 miles north of Boulder Creek, *Crum 2090* (CA, D, G, MB, NY, PA, P, UC, US). Monterey County: Monterey, 1897, *A. L. Bolton* (UC); Pajaro River, *Eastwood 4169* (CA, US). San Luis Obispo County: Pecho Creek, April 30, 1908, *Condit* (UC); Cambria Road, Santa Rosa Creek, June 13, 1911, *Condit* (UC).

Monolopia gracilens Gray is restricted to the South Coast Ranges of central California. This species has a higher altitudinal range than have the other members of the genus; apparently, also, it is less tolerant of aridity. In the Santa Cruz Mountains, where by far the greatest number of collections have been made, favorable habitats are openings in the mixed redwood forest, especially on steep slopes in disturbed soil; on Mount Diablo the species occurs on chaparral burns at elevations of 1500 feet to the summit. No specimens from the Santa Lucia Mountains in Monterey County have been seen but this may be due to less intensive collecting in this region. The species recurs in typical form in San Luis Obispo County. Although, to a slight extent, both range and habitat overlap those of *M. lanceolata* Nutt. and *M. major* DC., no observations of mixed colonies have been reported.

The growth form of this species is distinctive: in typical individuals the main stem is strictly erect and usually unbranched to a distance of one-fourth to three-fourths of the total height; the branches diverge widely from the main stem; the panicle inflorescence with heads terminating the branches is subcorymbose; often at the base in robust individuals there is, in addition, a whorl of decumbent-ascending primary branches. The basal and lower cauline leaves are usually crowded, sometimes almost rosulate. The specific name is slightly misleading; although

many small, slender individuals occur in all observed colonies, in favorable situations plants ninety centimeters high, bearing sixty to seventy heads in full flower at one time, are not infrequent. At the type locality where the species occurs on a serpentine outcrop, the average height of individuals is less than observed elsewhere.

Monolopia gracilens may be regarded as the most primitive member of the genus: the phyllaries are more variable in number than those of the remaining species and often one to three small scarious inner bracts are present. Furthermore, the achenes, which are subequal in width and thickness, show little divergence in this respect from the same structures in *Eriophyllum*.

2. *Monolopia stricta* sp. nov. Herba annua leviter albolanata glabratave; caules 10–60 cm. alti, simplices multiramose, ramis adscendentibus ad basin versus floriferis; folia basalia, 3.2–8 cm. longa, .3–3 cm. lata, oblanceolata, in petiolis attenuata, plerumque integra; folia caulina inferiora similia; folia caulina media 3.2–6 cm. longa, .6–2.5 cm. lata, lanceolata oblongo-lanceolatave, apicibus acutisve obtusisve, integra aut rarius undulata seu remote denticulata; pedunculi plerumque 3–5 cm. (1–14 cm.) longi, stricte adscendentes; capitula 1–15 ad numerosa (20–75), disci diametro 9–14 mm.; phyllaria plerumque 8, libera marginibus paullo imbricatis 5–7 mm. longa, 2–4 mm. lata, anguste ad late ovato-lanceolata rhomboideo-lanceolatave, in breviacuminatum apicem attenuata, ad basin versus obscure 3- ad 10-nervata, albolanata plerumque ad apicem versus pilis nigris tecta; receptaculum conicum glabrum laevigatum vel paullo scrobiculatum, basi 2–3 mm. diametro, 1.5–2 mm. altum; flores radii plerumque 8, aurei, limbis 4–15 mm. longi, (aliquando ad 2 mm. reducti), oblongis aut ellipticis, 8- ad 10-nervatis, apice rotundo integro vel minute 2- ad 3-denticulato, tubo .8–1.5 mm. longo, lobo posteriore ovato vel subrotundo, plerumque integro, ca. .3–1 mm. longo; flores disci plerumque numerosi (40–65) aurei, 1.5–2.5 mm. longi, tubo .3–.9 mm. longo, lobis .3–.5 mm. longis, pilis moniliformis sparsis obsoletisve; achenia uniformiter denseque griseo-strigulosa, radii haud obcompressa, 2.5–2.8 mm. (3 mm.) longa, 1.1–1.2 mm. lata, .8 mm. crassitudine, disci non vel haud obcompressa, 2.5–2.8 mm. (3 mm.) longa, .6–.8 mm. lata, .5–.6 mm. crassitudine.

Type. Two miles west of Lost Hills, Kern County, California, altitude 300 feet, May 2, 1935, *Herbert L. Mason 9314* (U.C. Herb. no. 628483; isotypes, CA, D, G, MB, NY, P, PA, US).

Open plains or slopes, Lower Sonoran zone, from 160 to 2000 feet altitude; lower foothills and valleys, San Carlos and Temblor ranges, San Benito County to Kern County; head and eastward borders of San Joaquin Valley; Kern County to Tulare County. Flowering period: March, April.

Stems 10–60 cm. high, simple to many-branched at the base or above, the branches ascending, floriferous from near base; herbage lightly white-lanate to floccose or glabrate, indument more dense and persistent at apex of peduncle; basal and lower cauline leaves 3.2–8 cm. long, .3–3 cm. broad, oblanceolate, usually entire, often withered at flowering time; median cauline leaves 3.2–6 cm. long, .6–2.5 cm. broad, lanceolate to oblong-lanceolate, apices obtuse or acutish, entire, or more rarely undulate or remotely dentate; peduncles usually 3–5 cm. (1–14 cm.) long, strictly ascending, the heads scattered, not subcorymbose; heads 1–15, or in robust, much-branched individuals numerous (20–75), the disk 9–14 mm. in diameter; phyllaries distinct, the margins slightly imbricate, usually 8, 5–7 mm. long, 2–4 mm. broad, narrowly to broadly ovate-lanceolate or rhombic-ovate, attenuate into the short-acuminate apex, distal portion usually black-lanate, obscurely 3- to 10-nerved toward base; receptacle 2–3 mm. in diameter at base, 1.5–2 mm. high, conical, smooth or slightly scrobiculate; rays usually 8, yellow, 8- to 10-nerved, 4–15 mm. long (or sometimes much reduced, 2 mm. long), the limb oblong to elliptical, apex rounded, entire or very minutely notched or 2- or 3-denticulate, tube .8–1.5 mm., posterior lobe .3–1 mm. long, ovate to roundish, entire or nearly so (rarely 2-parted); disk-florets in well developed heads, 40–65, yellow, 1.5–2.5 mm. long, tube .3–.9 mm. long, lobes .3–.5 mm. long, moniliform hairs sparse or obsolete; achenes uniformly densely gray-strigulose, ray achenes slightly obcompressed, 2.5–2.8 mm. (3 mm.) long, 1.1–1.2 mm. broad, .8 mm. thick, disk achenes not or scarcely obcompressed, 2.5–2.8 mm. (3 mm.) long, .6–.8 mm. broad, .5–.6 mm. thick.

Specimens examined. Merced County: 10 miles south of Los Banos, *Hoover 2882* (UC). San Benito County: Little Panoche Pass, *Eastwood & Howell 5137* (CA, UC); Panoche, April 9, 1937, *Y. W. Winblad* (CA). Fresno County: Zapato Chino, March 25, 1893, *Brandegee* (UC, US); Huron, March 24, 1893, *Brandegee* (UC); flood plain of Little Panoche Creek, *Hoover 404* (CA, UC), *J. Morrison 2810* (D, G, NY, UC, US); Little Panoche, April 8, 1937, *Y. W. Winblad* (CA); between Mendota and Firebaugh, *Hoover 882* (UC); Oil Canyon, *Eastwood & Howell 2057* (CA); Oil City, *L. S. Rose 35070* (UC); Jacalitos Canyon, 4 miles south of Coalinga, *J. T. Howell 5807* (CA). Kings County: Kettleman Hills above Kettleman City, *Hoover 2923* (UC). Tulare County: Exeter, February, 1900, *G. C. Roeding* (UC); Portersville, March 25, 1932, *Mrs. G. Earle Kelly* (UC); Terra Bella, *Abrams 10849* (D, P); 1.5 miles east of Terra Bella, *Constance & Mason 2122* (NY, UC). San Luis Obispo County: Carrizo Plain, *Keck & Clausen 3143* (D); Carrizo Plain near Soda Lake, *Eastwood & Howell 4117* (CA, UC). Kern County: between Blackwells Corner and Lost Hills, *Mason 6911* (UC); 3 miles east of Lost

Hills, *R. S. Ferris 9037* (CA, D, NY, UC); Buena Vista Hills, April 9, 1893, *Eastwood* (NY, UC); 3 miles south of Blackwells Corner, *J. T. Howell 5899* (CA); Blackwells Corner, *Crum 1380* (UC); *Hoover 947* (UC); Antelope Plain, 4 miles east of Blackwells Corner, *Crum 1965a* (UC); west end of Choice Valley, 3.5 miles from Annette, *Wiggins 7968* (D, UC); 7.5 miles north of Olig, *P. L. Johannsen 1433* (UC, VTM); Bakersfield, *Davy 1893B* (UC); Caliente Creek, 17 miles from Bakersfield, April 11, 1935, *K. Esau* (CA); mouth of San Emigdio Canyon, *A. Lewis 631* (VTM); 6 miles west of Buttonwillow, *Hoover 1850* (UC); Mount Breckenridge road, Greenhorn Mountains, *L. Benson 3066* (D, US); plains east of Kern, April 6, 1905, *Heller* (NY, US); Arvin, *Clokey 6958* (NY).

Monolopia stricta is confined mainly to the barren foothills of the inner South Coast and Tehachapi ranges and to the adjacent valleys. Judging from the number of collections, the species is best established on alkaline plains in Kern County. Although within the range of *M. lanceolata*, and frequently associated with that species, no intermediates have been observed. From Kern County northward along the eastern margin of San Joaquin Valley in Tulare County several collections of less typical plants have been made. The range of *M. stricta* does not overlap that of either *M. gracilens* or *M. major*.

In habit, *Monolopia stricta* differs markedly from the other three species of the genus. In typical, much-branched individuals, the main stem is short and the many, ascending branches terminate at all levels in comparatively short, strictly ascending peduncles. The strict position of the peduncles is unique in the genus, and in the field gives the species a very characteristic aspect. In addition, when the two species are associated in the same colony, the smaller heads and subtire shorter ray corollas of *M. stricta* contrast sharply with the large heads and conspicuous, deeply dentate ray corollas of *M. lanceolata*.

With respect to the distinct phyllaries, the small heads with subtire ray corollas, and the shape of the achenes, *Monolopia stricta* resembles *M. gracilens*. In both species the ray achenes are only slightly obcompressed and the disk achenes subequal in width and thickness. In growth habit and general aspect, however, the two species are very different: the main stem of *M. gracilens* is typically dominant, branched above and with branches and peduncles widely diverging. The achenes of *M. stricta* are constantly longer than those of *M. gracilens* and differ also in being uniformly short-strigulose rather than glabrate. The number of phyllaries is more constant in *M. stricta* (in well-developed heads almost uniformly eight); this condition may be regarded as an evolutionary advance compared to the varying number of phyllaries in *M. gracilens*.

Certain collections from Tulare County, and occasionally elsewhere, show what appears to be a response to more favorable

soil and moisture conditions. Stems are tall and slender with long internodes, peduncles longer than in the typical form and both rays and achenes are at the upper limits of variation in length. The aspect of such plants is less characteristic but in critical characters of achenes and ray corollas agree with other collections of the species. The strict position of the longer, more slender peduncles of these less typical plants is not always evident in herbarium specimens since they are often slightly wilted before being pressed.

3. *MONOLOPIA LANCEOLATA* Nutt. Proc. Acad. Phila. 4: 21. 1848; Jour. Acad. Phila. ser. 2, 1: 175. 1848. *M. major* var. *lanceolata* Gray, Bot. Calif. 1: 384. 1876; Hall, Univ. Calif. Publ. Bot. 3: 176. 1907, N. Am. Fl. 34: 82. 1915.

Stems 10-45 cm. (7-65 cm) high, stout to slender, erect, and simple to diffusely much branched from the base or above, the branches spreading; herbage densely white-lanate to glabrate on leaves and stems, usually dense on upper portion of peduncles and at base of involucre; basal and lower cauline leaves 1.3-10 cm. long, .4-1.3 cm. broad, oblanceolate, obtuse at apex; median cauline leaves 3-11 cm. long, .15-1.8 cm. broad, linear-lanceolate to broadly lanceolate, margins entire or undulate, more rarely dentate or remotely dentate, narrowed to obtuse or acutish apex; uppermost cauline leaves narrowly lanceolate or linear-lanceolate, the apex acute or acuminate; peduncles divergent, 1-13 cm. long; heads 1-70, the disk 9-20 mm. in diameter; phyllaries usually 8 (6-11), distinct, margins slightly imbricate, or very rarely some heads with two or three phyllaries united near base, 5-11 mm. long, 2.5-5 mm. broad, lanceolate to ovate- or rhombic-lanceolate, apex acute or acuminate, obscurely to rather prominently 3- to 5-nerved above the base, externally more or less white-lanate, the indument often deciduous except at base, distally the hairs with black pigment (or this rarely lacking); receptacle 2.5 mm. in diameter, 2.5-5 mm. high, broadly conical, acute, the attachment scars conspicuous, scrobiculate or palisade-like; rays usually 8 (6-11), conspicuous, bright yellow, 8- to 11-nerved, 9-21 mm. long, narrowly to broadly oblong or cuneate-oblong, 2- to 3-dentate at truncate apex, teeth .7-2 mm. long; tube 1.3-2.5 mm. long, glandular-hispidulous; disk-florets 25-100 (or only 2-6 in simple, dwarf plants), bright yellow, 2.5-3.8 mm. long, tube .5-2 mm. long, glandular-hispidulous, throat campanulate, 1-2.2 mm. long, lobes .3-.5 mm. long, moniliform hairs sparse and short to rather dense; achenes uniformly and densely (rarely sparsely) gray-strigulose, ray achenes obcompressed, convex, flat or subcarinate dorsally, 2.2-3.8 mm. (rarely 2 mm.) long, 1.3-1.5 mm. broad, .6-1.1 mm. thick, disk achenes noticeably obcompressed, obtusely angled or carinate dorsally and ventrally, sometimes asymmetrically so, 2.2-3.8 mm. (rarely 2 mm.) long, 1.2-1.5 mm. broad, .5-.8 mm. thick.

Valleys and open slopes in Upper and Lower Sonoran zones, 250 to 4400 feet altitude; locally common or abundant in colonies which are often extensive and dominant over considerable areas; inner South Coast ranges and adjacent valleys, San Joaquin County to San Luis Obispo and Kern counties, north along the eastern borders of San Joaquin Valley to Fresno County; Tehachapi region, eastward to Mojave, Kern County; cismontane southern California, Santa Barbara County to Riverside County. Flowering period, March, April, May.

Specimens examined. Without exact locality: "line of the San Joaquin, March, 1846, Fremont's Expedition to California." San Joaquin County: between Mountain House and Tracy, 2 miles east of Midway, *Mason 6827* (UC); Corral Hollow, Mount Hamilton Range, *H. K. Sharsmith 1482* (D, UC), *1490a* (UC). Stanislaus County: 4 miles above mouth of Arroyo del Puerto, Mount Hamilton Range, *H. K. Sharsmith 1541* (UC), *1622* (D, UC); 12 miles above mouth of Arroyo del Puerto, *H. K. Sharsmith 1811* (D, UC). Merced County: Wrights, 17 miles west of Los Banos, April 3, 1912, *Wooton* (US); 10 miles south of Los Banos, *Hoover 2887* (UC). San Benito County: Griswolds Canyon, May 29, 1899, *Dudley* (D); near summit of Panoche Pass, March 25, 1923, *F. O. Ballou* (D); Little Panoche Pass, *Eastwood & Howell 5136* (CA). Monterey County: Arroyo Seco, March, 1890, *E. K. Abbott* (D, NY); lower Arroyo Seco Canyon, *Hoover 2984* (UC); Arroyo Seco, 10 miles from Soledad, *R. S. Ferris 1947* (D); Soledad, *Congdon* (UC); 5 miles northeast of Abbots, *Constance & Hoover 2061* (NY, UC); between King City and San Lucas, *R. S. Ferris 7503* (D, UC); Poncho Rico Canyon, 6 miles east of San Bernardo, *J. T. Howell 5992* (CA); 3.5 miles east of Pleyto Well, *C. A. Graham 238* (VTM); west of Kirk Canyon, *H. S. Yates 5369* (VTM); south of King City near San Lorenzo Creek, April 2, 1903, *Dudley* (D); 2 miles south of King City, *A. M. Carter 1107* (CA, UC, US); 4 miles north of San Ardo, Salinas River Valley, *Constance 2085* (NY, UC); junction of Bryson road with Jolon-Bradley road, *R. S. Ferris 8441* (CA, D, G, UC, US); 12 miles southeast of Jolon, *A. M. Carter 1088* (D, G, MB, UC), *1089* (UC); summit of Jolon grade, *Keck 2068* (P). Fresno County: Alcalde, April, 1891, *Brandege* (UC); Alcalde Canyon, 4 miles west of Coalinga, *Crum 1964* (CA, D, G, MB, NY, P, PA, UC, US); between Alcalde and Coalinga, *Eastwood 13513* (CA); 14 miles east of Coalinga, *J. T. Howett 5797* (CA); Los Gatos Canyon, 4 miles north of Coalinga, *J. T. Howell 5801* (CA); Huron, May 7, 1893, *Eastwood* (G); Kings River at Piedra, *L. S. Rose 34095* (UC); 3 miles northwest of Mercy Hot Springs, *Crum 1959* (CA, D, G, MB, NY, UC, US). Kings County: Kettleman Hills above Kettleman City, *Hoover 2927* (UC). Tulare County: near Frazier Pass from Porterville, March 26, 1897, *Dudley* (D); Tulare, *Davy 3072* (UC); between Earlimart and Delano, *Eastwood 3951* (CA, US); be-

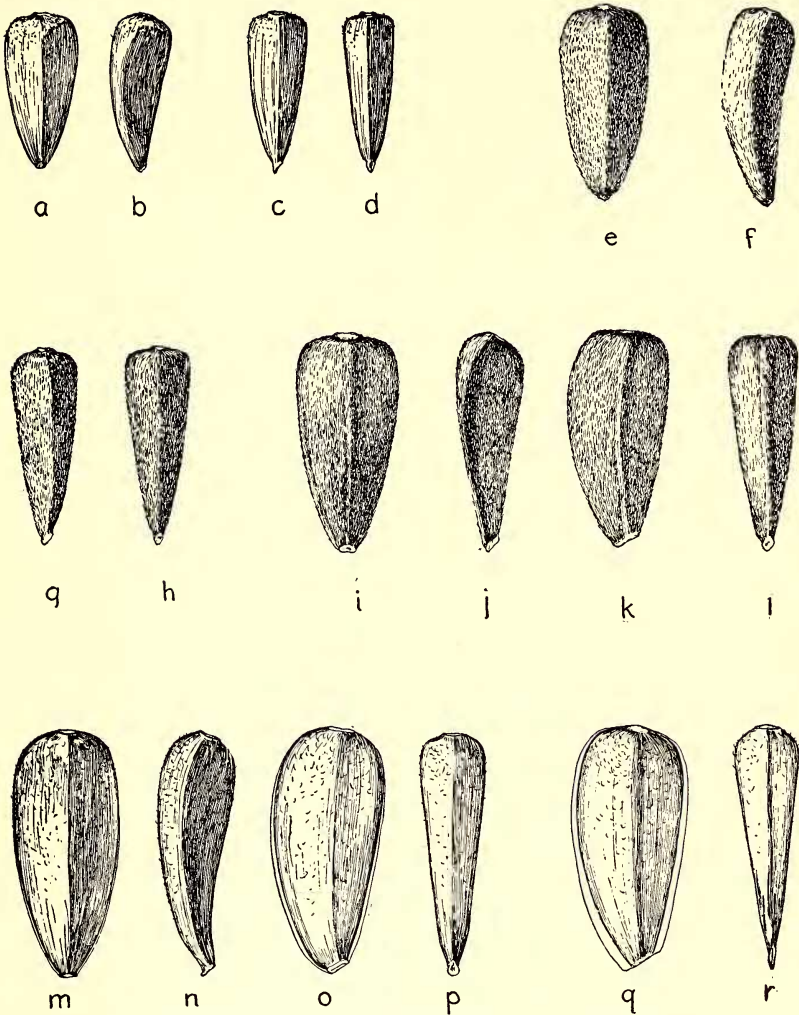


FIG. 2. Achenes of *Monolopia*, ventral and lateral surfaces. *M. gracilens*: ray, *a*, ventral, *b*, lateral; disk, *c*, ventral, *d*, lateral. *M. stricta*: ray, *e*, ventral, *f*, lateral; disk, *g*, ventral, *h*, lateral. *M. lanceolata*: ray, *i*, ventral, *j*, lateral; disk, *k*, ventral, *l*, lateral. *M. major*: ray, *m*, ventral, *n*, lateral; disk, *o*, *q*, ventral, *p*, *r*, lateral.

tween Richgrove and Ducor, *Hoover 456* (UC). San Luis Obispo County: Paso Robles, April 9, 1899, *J. H. Barber* (P, UC, US), *A5* (MB, UC); Shandon, *Geo. B. Grant 5753* (UC, D); Carrizo Plain, March 29, 1910, *Condit* (UC); northeast edge of Carrizo Plain, *Wiggins 5822* (CA, D, P, NY, UC, US); Cuyama Canyon, April 28, 1926, *M. E. Jones* (P); upper Cuyama Valley, *L. Benson 3570* (US); Cuyama Valley, 45 miles west of Maricopa, *L. S. Rose 36066* (MB, UC); Cholame, *Eastwood 13873* (CA), *Wiggins*

5785 (CA, D, P, NY, UC); 35 miles east of Paso Robles, *Munz 10183* (P); La Panza, *E. Armstrong 1116* (VTM); San Miguel, *A. Lewis 45* (UC, VTM); Union, *Eastwood & Howell 2000* (CA); Nipomo, *Brewer 420* (G, sheet with both *M. lanceolata* and *M. major*; UC and US sheets, *M. major* only; probably, however, the latter species does not occur at Nipomo); 2.2 miles southeast of Nipomo, *C. M. Belshaw 1624* (VTM); west side Cottonwood grade, headwaters of Estrella River, *Keck 2168* (D). Kern County: Fort Tejon and vicinity, *Xantus De Vesey 49* (US), *Abrams 11734* (D); Tejon Pass, May 12, 1882, *Pringle* (MB, PA, NY, US); Tehachapi, June, 1884, *K. Brandegee* (UC), May 20, 1903, *M. E. Jones* (D, P, US), May 5, 1905, *Heller* (UC), *Eastwood 3242* (CA, US); Tehachapi Plains, *Hasse & Davidson 1731* (UC); Bakersfield, *Davy 1704* (UC), *1734* (UC); 3 miles south of Blackwells Corner, *J. T. Howell 5898* (CA); between Blackwells Corner and Lost Hills, *Mason 6907* (UC); 4 miles east of Blackwells Corner, *Crum 1965b* (D, G, NY, UC, US); Antelope Valley, 1 mile northwest of Kecks Corner, *Crum 1966* (CA, D, G, MB, NY, P, PA, UC, US); between Mojave station and Tehachapi, February-May, 1885, *Gray* (G); Mojave, *Davy 2166* (UC); south of Mojave, *I. M. Johnston 2253* (P, US); 5 miles south of Mojave, *Munz 10079* (P); between Rosamund and Mojave, *Abrams 11202* (D); Willow Springs, *Munz 10021* (P, UC); Kern Canyon, *Heller 7656* (D, G, MB, PA, NY, UC, US); north of Kern, March 16, 1913, *Wooton* (US); Kern River, *E. Roy Weston 507* (CA); Rattlesnake Grade, Greenhorn Mountains, *E. Roy Weston 601* (CA); Caliente Canyon, April 6, 1935, *E. Roy Weston* (CA); Salt Creek, south end of San Joaquin Valley, *A. Lewis 625* (VTM, UC); San Emigdio Canyon, *Davy 1990* (UC); Elk Hills, *P. L. Johannsen 1471* (VTM, UC); west end of Choice Valley, 3.5 miles from Annette, *Wiggins 7966* (D, UC); northwest of Fellows, *P. L. Johannsen 1467* (VTM, UC); 6 miles west of Buttonwillow, *Hoover 1849* (UC); Cottonwood Canyon, Arenal Ridge, 4 miles northeast of Cholame, *Constance 2091* (NY, UC); Carrizo Plain road, 1 mile below junction of Maricopa-Santa Maria highway, *R. S. Ferris 9304* (D); 15 miles southwest of Maricopa, *Munz 13602* (D, P, UC). Santa Barbara County: Santa Barbara, *Elmer 3777* (CA, D, G, MB, NY, P, UC, US); Point Sal, 18 miles southwest of Santa Maria, *A. M. Carter 1100* (G, MB, NY, UC); near Loma Paloma, San Rafael Mountains, *Hall 7805* (UC); Cuyama Canyon, April 28, 1926, *M. E. Jones* (P). Ventura County: above San Buena Ventura, March 5, 1866, *S. F. Peckham* (US); Cuyama River, *Clokey 6953* (NY). Los Angeles County: San Fernando below Los Angeles, 1850, *Parry* (G, NY); Los Angeles, 1853-54, *Bigelow* (NY, US); Highland Park, *Geo. B. Grant 798* (D, G, MB, PA), *L. A. Greata* (D, UC); Cahuenga Pass, *Brewer 185* (G, UC, US); Pasadena, May 3, 1882, *M. E. Jones* (P); Elizabeth Lake, *Parish 1962* (D, UC); San Pedro Hills near Rocky Point, *Abrams 3142* (D, P, PA, NY);

Santa Monica Mountains, *Abrams 1317* (D, NY); Palos Verdes Hills near Redondo, April 9, 1897, *McClatchie* (D, NY); Tujunga Canyon, *Peirson 526* (J). Riverside County: Menifee, 1893, *M. A. King* (UC).

Monolopia lanceolata Nuttall is the most widely ranging species of the genus and its most southerly representative. The distribution is apparently continuous and the species common within its range; outlying collections are not far removed from well-populated areas, excepting those from stations in the desert; these colonies presumably arrived by way of Tehachapi Pass where the species has often been collected. These occurrences and also the northerly stations along the eastern borders of the San Joaquin Valley may represent recent colonization. The range of *M. lanceolata* includes that of *M. stricta* and overlaps that of *M. major* in the inner South Coast ranges and adjacent valleys from Monterey and Merced counties to San Joaquin County. Different habitat requirements segregate this species from *M. gracilens* which also occurs in the South Coast ranges but at higher elevations and, in general, nearer the coast.

Apparently tolerant of both aridity and alkalinity, *Monolopia lanceolata* finds a favorable habitat along the barren western borders of the San Joaquin Valley and in the foothills and passes of the inner South Coast and Tehachapi ranges; it is especially abundant in Kern and San Luis Obispo counties. Collections indicate that in California north of Tehachapi the species inhabits the Lower Sonoran zone, also the Upper Sonoran at relatively low altitudes, mainly in portions adjacent to or not far distant from Lower Sonoran extensions; in the Tehachapi Range and in southern California, it occurs in the mountains at considerable elevations (Tehachapi, 4000 feet, May 20, 1905, *M. E. Jones*; Loma Paloma, 4400 feet, *Hall 7805*); from San Luis Obispo County southward to Los Angeles County, the range extends westward to the coast.

Robust habit, diffuse branching, long, divergent peduncles and large heads with conspicuous dentate rays, characterize *Monolopia lanceolata*. All of these characters serve to distinguish the species from *M. stricta*; the achenes are much more obcompressed than those of *M. stricta* and *M. gracilens*; in pubescence, which is usually uniformly and densely strigulose, the achenes resemble those of *M. stricta*. From *M. major* it is readily distinguished by the distinct phyllaries and by the details of floral and achenal characters mentioned below in the discussion of the latter species.

The range of variation in *Monolopia lanceolata* is rather wide: in some plants the indument is dense and nearly uniformly distributed; other plants are glabrate; the indument is more or less deciduous on leaves and stems and on the distal portion of the phyllaries; it is always somewhat persistent, however, on the upper portion of the peduncle just below the involucre.

Variation in amount and color of pubescence is apparently not correlated with geographic distribution. Field notes mention that certain collections of glabrate plants are from wet situations. The amount of black pigment developed in the hairs (mainly of the distal portion) of the phyllaries also varies widely; in some collections, also, the black hairs are deciduous, the white persistent; in a few collections, black pigment in the pubescence of the phyllaries is lacking. The variation in achenal characters, however, has some geographic significance. Colonies in certain regions show characteristic divergences: achenes of plants in the vicinity of Santa Barbara are unusually long (3.2 mm.); those from near Jolon, Monterey County, are narrow and also somewhat asymmetrical, the dorsal and ventral carinae being displaced from the median position; certain colonies in Kern and Tulare counties lower the limits of achenal length to two millimeters.

Monolopia lanceolata and *M. stricta* both follow their preferred habitat around the head of San Joaquin Valley and northward along the eastern borders of San Joaquin Valley to Fresno and Tulare counties respectively. On these northeastern outposts which may represent recent colonization, the two species are less markedly different in aspect. Plants of *M. lanceolata* are tall and more slender; the divergence of the peduncles is less noticeable and the diameter of the disk is smaller. As mentioned above, *M. stricta* from the same region is also somewhat modified, hence in general appearance the two species approach each other. Conceivably, these changes may be due to the reaction of both species to new environmental factors, such as more fertile soil and increased rainfall. However, in *M. lanceolata* variation in the length and width of the achenes is much greater than occurs within a similar area elsewhere. This diversity may be due to genetic disturbance caused possibly by a certain amount of hybridization between the two species.

4. *MONOLOPIA MAJOR* DC. Prodr. 6: 74. 1837.

Stems slender to robust, 8–50 cm. (65–70 cm.) high, erect, simple or simple at base, dichotomously branched above, or less frequently branched at base, branches few to numerous, spreading; herbage white-lanate, the indument more or less deciduous in age, persistent at base of involucre and on upper portion of peduncles near apex; basal and lower cauline leaves not crowded, .7–1.0 cm. long, .15–.7 cm. broad, oblanceolate, the margins saliently to obscurely dentate, undulate or subentire, the apex obtuse, acute or acuminate; median cauline leaves 3–16 cm. long, .4–1.5 cm. broad, narrowly to broadly lanceolate, the margins saliently dentate to remotely or obscurely undulate or entire; peduncles 1–12 cm. long, divergent; heads 1–20 (or 35), disk 10–19 mm. in diameter; involucre 8–13 mm. long, the phyllaries united for about one-half their length, lobes usually 8 (5–10), 3–6 mm.

long, 3–7 mm. broad, ovate or deltoid, usually slightly broader than long, 3-veined, the veins more prominent in fruit; receptacle 3–6 mm. high, 3.5–5 mm. in diameter, conical to ovoid, more or less scrobiculate; rays usually 8 (5–10), bright yellow, 8–20 mm. long, 4–14 mm. broad, the limb oblanceolate-oblong or cuneate-oblong with 9–13 greenish veins, apex truncate, dentate or subincised, the teeth .5–2 mm. long, the tube slightly hispidulose to glabrate, 2–3 mm. long; disk-florets 45–170 (or in dwarf plants 3–5 only), bright yellow, 3–4.5 mm. long, the tube and lower portion of throat hispidulous, tube .8–2.3 mm. long, throat tubular-campanulate, attenuate at base, 1.1–2.5 mm. long, lobes .3–.6 mm. long, moniliform hairs usually numerous; achenes black or blackish-brown, glabrate or somewhat strigulose dorsally and ventrally near apex, the hairs slightly curled, laterally with a narrow membranous margin usually best developed toward the base, ray achenes obcompressed (ventral angle rarely with narrow membranous margin), 2.5–4 mm. long, 1.3–1.5 mm. broad, 8–1.1 mm. thick; disk achenes much obcompressed, more or less carinate dorsally and ventrally, 2.5–4 mm. long, 1–1.6 mm. broad, .7–.8 mm. thick.

Locally abundant, slopes and valleys, Upper and Lower Sonoran zones, altitude 600 to 1500 feet; inner North Coast ranges and adjacent valleys, Tehama County to Marin, Napa and Solano counties; western borders of Sacramento-San Joaquin Valley, San Joaquin County, in Stanislaus County east to Waterford; inner South Coast ranges and adjacent valleys, Contra Costa and San Mateo counties to Monterey County. Flowering period: March, April, May.

Specimens examined. Without locality: California, 1833, *Douglas*, (G, NY); Feather River, May, 1853, *Bigelow* (G, NY); Sacramento Valley, April, 1876, *Lemmon* (UC). Tehama County: Salt Creek, tributary of the Cottonwood, *Jepson 21025* (J). Glenn County: west of Willows, *Eastwood 11142* (CA). Lake County: without locality, June, 1884, *Brandegee* (UC); Lower Lake, *A. M. Bowman 256* (D). Colusa County: without locality, April, 1889, *K. Brandegee* (UC); Venado, *Hoover 3223* (UC); Bear Valley, 4 miles south of Leesville, *Crum 2035* (CA, D, G, MB, NY, P, PA, UC, US). Sonoma County: Petaluma, *Bolander 4665* (G, UC, US), May, 1880, *Congdon* (D); east of Santa Rosa, April 4, 1902, *Heller* (US). Yolo County: near Madison, *Heller & Brown 5411* (D, G, MB, NY, P, PA, US). Sacramento County: Sacramento, *Hartweg 1789* (G, NY). Napa County: Napa Junction, April, 1888, *Sonne* (UC); Napa Valley, May, 1863, *Bigelow* (NY, PA). Solano County: Montezuma Hills, *Jepson 21057* (J), March 21, 1902, *R. H. Platt* (UC); Little Oak, near Vacaville, *Jepson 21027* (J). Marin County: San Rafael, *Rattan* (D). San Francisco County: Potrero Hills near San Francisco, April, 1857, *Bloomer* (G, NY); near San Fran-

cisco, 1866, *Kellogg* (G, MB, NY, US); San Francisco, *Sutton Hayes* 487 "El Paso and Fort Yuma wagon road expedition" (US). San Mateo County: Santa Cruz Mountains, May, 1898, *Abrams* (D). Contra Costa County: Antioch, *Kellogg & Harford* 508 (CA, MB, NY), April 8, 1869, *Kellogg* (D), May, 1883, *K. Brandegee* (UC), May, 1891, *Brandegee* (UC), *Brandegee* (D, CA), *Davy* 929 (MB); Byron, *C. F. Baker* 2796 (CA, P, UC); Byron Springs, *Eastwood* 3803 (CA, G, NY, US); south of Byron, *Wiggins* 4584 (D, P, UC); 2 miles west of Byron, *Crum* 1741 (CA, D, G, MB, NY, UC, US), *Crum* 2083 (CA, D, G, MB, NY, UC, US); Moraga Valley, 1883, *Chesnut* (UC); Briones Valley, *Chandler* 582 (UC); Kirker Pass, *Hoover* 311 (UC); Lone Tree Valley, *Hoover* 2899 (UC); Mount Diablo, south of Arroyo del Cerro, *M. L. Bowerman* 1862 (UC), Oyster Ridge, 1365, (UC), east of Alamo Creek Canyon, 2196 (UC). San Joaquin County: French Camp, *J. A. Sanford* 16 (UC); Linden, May, 1896, *F. W. Gunnison* (UC); Bethany, *C. F. Baker* 2790 (CA, G, MB, NY, P, UC, US); Tracy, *Jepson* 9595 (J), *Crum* 590 (G, UC); Hospital Canyon, *E. E. Stanford* 1231 (MB); Corral Hollow, Mount Hamilton Range, *H. K. Sharsmith* 1490 (UC), 1495a (UC), 1500a (D, UC); Morada near Stockton, April 20, 1920, *Mrs. A. H. Ashley* (CA). Alameda County: Oakland Hills, *Bolander* 328 (G, NY), *Bolander* 2392 (UC, US); Oakland, April, 1889, *Chesnut* (US); Berkeley Hills, May, 1893, *Michener & Bioletti* (MB); head of Claremont Canyon near Berkeley, *Tracy* 1432 (D, P, UC); Redwood Canyon, east Oakland, *W. W. Carruth* (CA); Livermore Valley, March, 1887, *Rattan* (D); Livermore, March 25, 1888, *Greene* (US); near eastern end of Altamont Pass, *Abrams* 9945 (D); Coast Range near Tracy, *E. E. Stanford* 793 (D, G, MB, P); Mountain House, *L. S. Rose* 33022 (CA, NY, UC); Corral Hollow near Pottery, Mount Hamilton Range, *H. K. Sharsmith* 3415 (D, UC); 1 mile northeast of Tesla, *H. S. Yates* 5497 (VTM, UC); 1.5 miles northwest of Tesla, *Crum* 1975 (CA, D, G, MB, NY, UC, US); divide between Corral Hollow and Arroyo Seco, Livermore road, *R. S. Ferris* 9427 (D, UC). Santa Clara County: Coyote Creek, Coyote, *Davy* 98 (UC); Coyote Creek, *Jepson* 21026 (J); near Coyote, *R. S. Ferris* 819 (D); 4 miles south of San Jose, May 1, 1887, *Rattan* (D); near Botany Building, Stanford University, March 30, 1893, *Dudley* (D); Los Buellos Hills, Milpitas, April, 1906, *R. J. Smith* (D, UC), Los Buellos Hills, April, 1905, *C. S. Williamson* (PA); Mount Hamilton, July 14, 1906, *R. J. Smith* (PA); Pacheco Pass, *Eastwood* 14095 (CA). Stanislaus County: Westley, *Hoover* 231 (UC); 4 miles east of Waterford, *Hoover* 756 (UC); Salada Canyon, 9 miles southwest of Patterson, *Schreiber* 2300 (VTM, UC), *Crum* 1760 (CA, D, G, MB, NY, UC, US). Merced County: Merced, *Eastwood* 4427 (CA). San Benito County: 2.7 miles south of Paicines, *R. S. Ferris* 8342 (D, G, UC); 1 mile north of Paicines, *J. T. Howell* 11048 (CA); 8 miles northwest of Hernandez, *Crum* 990 (G, UC).

Monterey County: 4 miles southwest of Soledad, *Mason 5042* (UC); Poncho Rico Canyon, 6.6 miles east of San Bernardo, *J. T. Howell 5996* (CA); 1 mile northeast of King City, *R. C. Wilson 419* (VTM, UC).

Monolopia major DC. is especially abundant in central California in Alameda, Contra Costa, and San Joaquin counties, less so in Santa Clara County; from this center of population, which includes fifty per cent of the localities of collection, the species extends northward and southward, mainly along the interior valleys and lower foothills of the inner North and South Coast ranges; northward, it is the sole representative of the genus; southward, it overlaps the range of *M. lanceolata* and in a few localities is contiguous to that of *M. gracilens*. Near the limits of its range, the species is apparently casual, many counties being represented by a single collection. This scarcity is probably real; although certain of these counties have been visited by comparatively few collectors, in others, for example, Lake, Napa, and Solano counties, collecting has been rather intensive. Westward and eastward, respectively, the most outlying records of occurrence are: San Rafael, Marin County (*Rattan*); four miles east of Waterford, Stanislaus County (*Hoover 756*), a near approach to the Sierra Nevada foothills. Since *M. major* is very common in cultivated fields, its presence at certain outlying stations may be due to transportation of the achenes with seeds of crop plants.

The most favorable habitats of this species are open slopes or valleys in the Upper Sonoran zone, the altitudinal range being lower than that of *Monolopia gracilens*. On Mount Diablo, for example, *M. major* occurs on grassy hillsides from the base to about 1500 feet altitude (*M. L. Bowerman 2196*), *M. gracilens* on chaparral burns above that elevation to near the summit (*M. L. Bowerman 767*). The species is probably less tolerant of aridity than either *M. lanceolata* or *M. stricta*.

In general aspect, *Monolopia major* is very similar to *M. lanceolata* although averaging larger in all its structures; the two species agree in their robust habit, diffuse branching, long peduncles, and large conspicuous heads with long, dentate rays. Compared to *M. lanceolata*, however, typical plants of *M. major* have less numerous branches, fewer heads and longer ray corollas. The species differs also from *M. lanceolata* in the longer, tubular-campanulate disk corollas, and in the longer, more flattened, glabrate or sparsely strigulose achenes; the pubescence of the achenes in *M. major* is sparse and distributed mainly on the upper portion while in *M. lanceolata* it is usually dense and uniformly distributed; moreover, in *M. major* the hairs are recumbent and slightly curved while in *M. lanceolata* they are straight and closely appressed.

In relation to the assumed ancestral condition, *Monolopia major* is the most divergent member of the genus. This is indi-

cated by the connate phyllaries, which form a lobed cup, and by the achenes which are the most extremely obcompressed in the genus and which have developed a narrow membranous margin on the proximal third or, more rarely, extending the entire length. This latter tendency is most marked toward the northern limits of distribution. Although the species is otherwise fairly constant throughout its range, occasional aberrant individuals are encountered: ray and disk corollas may be cream color and pale yellow respectively instead of the usual bright yellow (*Hoover 311*); ray corollas are sometimes deeply lobed (lobes 6 mm. long, *Hoover 2899*). Although occasionally occurring together, *M. major* and *M. lanceolata* apparently do not hybridize. Among the collections examined, a few individuals were noted in which two or three of the phyllaries of a head were united near the base, the others distinct; in remaining characters, these plants were referable to *M. lanceolata*.

SPECIES EXCLUDED

Monolopia bahiaefolia Benth. Pl. Hartw. 317. 1849 = PSEUDOBAHIA BAHIAEFOLIA (Benth.) Rydb.

Monolopia bahiaefolia var. *pinnatifida* Gray, Bot. Calif. 1: 383. 1876 = PSEUDOBAHIA HEERMANNII (Durand.) Rydb.

Monolopia californica (Lindl.) Fisch., Mey. & Ave.-Lall., Ind. Sem. Hort. Petrop. 9:80. 1843 = LASTHENIA GLABRATA Lindl.

Monolopia glabrata (Lindl.) Fisch. & Mey. Ind. Sem. Hort. Petrop. 9: 80. 1843 = LASTHENIA GLABRATA Lindl.

Monolopia Heermannii Durand. in Jour. Acad. Phila. ser. 2, 3: 93. 1855 = PSEUDOBAHIA HEERMANNII (Durand.) Rydb.

Monolopia minor DC. Prodr. 6: 74. 1837 = BAERIA sp.?

Department of Botany,
University of California, Berkeley,
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REVIEW

Flora of Mount Shasta. By WILLIAM BRIDGE COOKE. American Midland Naturalist. Volume 23, pp. 497-572 with 8 plates. The University Press, Notre Dame, Indiana, May, 1940.

With this publication, "the Naturalist" has added another item to its useful series of West-American local floras. Until recently, the great majority of floristic surveys of this section have been manuals of state-wide or regional scope. Very few western states are even yet adequately provided with general floras. It is not surprising, therefore, that intensive study of local areas has lagged badly.

Mount Shasta is at once the second highest peak in the Cascade Range and nearly its southernmost, being well separated by a broad belt of semiarid vegetation from its closest, geologically related fellows. The first catalogue of its flora was provided in